Ansys + ZF Group

"The integration of Ansys AVxcelerate into our Virtual Test Drive platform offers a disruptive solution for both hardware (HiL) and virtual hardware (SiL) testing, delivering trustable physics-based camera and radar simulation capabilities. This reduces physical testing for a significant cost-saving advantage, and allows for easy regeneration of synthetic data during sensor selection and placement. We can test systems in complex situations involving multiple vehicles, pedestrians, various objects, and challenging environmental conditions."

Lars Schories

Project Lead, Corporate Research and Development / ZF Group

CASE STUDY

Introduction

ZF's end-to-end development solution, its Virtual Test Drive tool chain, is defined by numerous simulation tools and solvers running in the background simultaneously to test autonomous driving and advanced driver-assistance systems (AD/ADAS) perception. In introducing Ansys AVxcelerate Sensors (AVx) into this tool chain, along with software from other domains, ZF will create more comprehensive sensor models for perception testing that leads to a deeper understanding of radar and camera in a single simulation environment.

Challenges

Complexity is the single biggest challenge for ZF in the validation of the self-driving domain defined by sensors. To facilitate the Virtual Test Drive environment required the commingle of multiple physics-based AD/ADAS sensor simulations for radar and camera into one continuous tool chain. During the integration of AVxcelerate Sensors for different autonomous applications within the Virtual Test Drive Toolchain — including dSPACE and IPG Carmaker — any efforts must be adapted and matched to ZF's current tool chain for AD/ADAS simulation. All aspects of analysis must be considered in this co-simulation environment, as well as the efficacy of the synthetic data produced.

Technology Used

- Ansys AVxcelerate Sensors
- Ansys Speos
- Ansys HFSS

Engineering Solutions

Incorporating AVxcelerate Sensors into its existing tool chain enabled ZF to enhance its Virtual Test Drive tool chain with an accurate, reliable scenario-based approach to virtual sensor testing and validation for radar and camera. The sensor simulation software became part of a well-rounded collection of tools and solvers covering virtual hardware/software, radar signal, and perception testing. At the end of the complete tool chain, ZF combined the resulting sensor models via IPG CarMaker and AVxcelerate Sensors to demonstrate complete system functions and software integration in a single cloud-based simulation environment. This activity happens within an open-loop system for the immediate future, sequentially adding data from one software to the other.

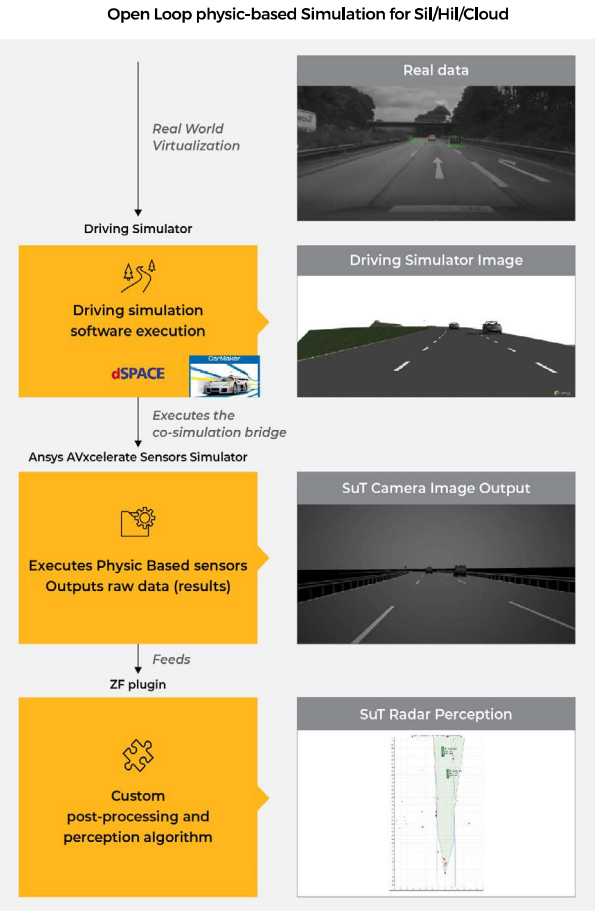

Figure 1. General workflow deployed for ZF's Virtual Test Drive project.

Benefits

- AVxcelerate Sensors supports a high-fidelity, physics-based approach by inserting a high degree of data accuracy and trust into radar and camera analysis. It delivers the level of openness needed for seamless connection to the entire Virtual Test Drive tool chain.
- Thanks to the compatibility of Ansys software with other tools and solvers, ZF could combine all of the different software within the Virtual Test Drive environment for more comprehensive and robust AD/ADAS system analysis than previously possible, significantly reducing testing time and costs.
- By incorporating AVxcelerate Sensors in the Virtual Test Drive tool chain, ZF developed a common yet customizable ecosystem that OEMs can leverage to get a more complete picture early in the design cycle. This enables them to evaluate how multiple systems perform both separately and connected together.

Benefits

- Radar beam patterns change due to sensor type and radar placement. ZF introduced a feature that facilitated data import from Ansys HFSS into AVxcelerate Sensors to help the team more accurately analyze and understand radar beam pattern and positioning for a specific radar sensor as a function of its overall performance.
- Connecting Ansys Speos and AVxcelerate Sensors within Virtual Test Drive will enable ZF to describe a camera lens system and calibrate the different types of lens effects within that system. With this combination of powerful solvers, ZF is able to extract raw data to further test and enhance to the camera before it is integrated into a larger perception stack.
- ZF will tap into this capability in the future to understand environmental effects such as camera lens flare within the context of AD/ADAS perception systems. With AVx, they are able to create very accurate lens models that can be used to drill down on any details that may lead to errors.

Company Description

ZF is a global technology company supplying systems for passenger cars, commercial vehicles, and industrial technology, enabling the next generation of mobility. ZF allows vehicles to see, think, and act. In the technology domains of vehicle motion control, integrated safety, automated driving, and electric mobility, ZF offers comprehensive product and software solutions for established vehicle manufacturers.

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